

5-2012

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Society and Science: Ancient Astronomy

A THESIS PRESENTED IN PARTIAL FULLFIMENT OF THE REQUIREMENTS OF
THE HONORS IN DISCIPLINE PROGRAM FOR THE BACHELOR OF SCIENCE
DEGREE IN HISTORY

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I. Introduction

Astronomy is among the oldest sciences man has striven to study. The skies have served as a theater for the human mind and eyes since our species has developed the cognizance necessary to gaze at the sky and to ask why. In the infancy of our civilizations we peered at the vast shapes and lights in the sky and saw things familiar to us: bulls, birds, men, and dragons. We tried to rationalize that which we did not know with that which we could invent with our imaginations. The skies became an outward interpretation of how we viewed the world. It was our blank canvas to fill with our minds.

Different societies viewed the skies in different ways. The Egyptians and Mayans viewed the universe in cycles. The Mesopotamians viewed the cosmos as chaotic. The Greeks and Romans tried with some success to explain the skies with mathematics, albeit with a minute mixture of astrology and mythology. The entire ancient world interjected astrology, mythology, and divination into their astronomy, cosmology, and origin fables, to what degree and in what method varied between cultures and depended greatly on the outward circumstances differentiating the areas in which they were created. By observing the phenomenal laws, for which they were supremely ill equipped to explain, they incorporated the scientific world into the society in both religious and familial ways.

Stone Age peoples placed much importance on the happenings of the sky. Being part of the indescribable natural phenomena that surrounded them, these ancient peoples gazed up and took notice of what they saw. An astronomical sign might display a foreboding from the gods or a message directed for them to carry out. Many of these prehistoric cultures built shrines to the geometry of the sky. Stonehenge in England plays

a significant astronomical role, as do other Stone Age monuments. These places are significantly different, however, from our modern observatories, as these places were heavily religious and also social meeting grounds, some for burials, religious festivals, and other socially crafted functions.¹

As human society progressed from a nomadic one to an agricultural one, the importance of astronomy to ancient peoples increased greatly. As different peoples gazed into the skies, they became aware of patterns, cycles that the skies went through. They soon discovered that they could predict seasons and macro weather patterns that were likely to affect them. For a society that was dependent on the outcome of the current year's crop or knowing when a rainy season was to begin, the knowledge gained from the sky was a life or death knowledge, imperative to their own and their communities survival. The entirety of all of ancient calendar making and resource planning depended on such observations made of the sky.

In the Fertile Crescent, all societies looked to the stars and night sky for societal and practical reasons. In addition, their geophysical location in the area had ramifications on how they viewed the world and their own place in it. In these ancient cultures, Astronomy was forever bounded to the ideas of astrology and cosmology, very much unlike today's wall of separation between the pseudoscience of astrology and the specialized study of cosmology, which borrows some knowledge of astrophysics and astronomy. All of these disciplines combined made up the ancient beliefs in what these objects in the sky were, along with the sun, moon, and planets and also what the patterns of movement meant, in addition to their impact on human life.

¹T. Schmidt-Kaler & W. Schlosser, *Stone-Age Burials as a Hint to Prehistoric Astronomy*. R.A.S. Canada Journal V.78:5, NO.590, 1984. P. 178.

II. Astrology, Astronomy and Cosmology of Ancient Egypt

The Egyptians were agricultural peoples, whose livelihood depended upon the great Nile River. The Nile sustained almost every portion of their lives by providing irrigation, food, transportation, and water. As compared with other ancient societies, the Egyptians enjoyed a relatively peaceful and prosperous life. They enjoyed an abundance of food and livestock and were many times sheltered from the experiences of drought and famine, which other ancient cultures endured. All of their stability depended on the Nile and they constructed the entirety of their worldview around it. Most of the origin stories in ancient cultures deal with primordial water. One of the Egyptian myths dealt with primordial water and the god Ptah who emerged forth from it and created the whole world.² The importance placed on water runs throughout Egyptian societal science and other ancient cultures.

When the Egyptians moved their eyes from the Nile and focused them upwards towards the heavens, the great river still influenced what they saw and how they explained phenomena. The Nile flooded in a predictable pattern and it flooded comparably peacefully to other potamologic behaviors. Star positions and positions of other sky objects could accurately predict the flooding of the Nile.³ The Egyptians took particular note of a bright star in the constellation Canis Major. This star would appear during sunrise and sunset and signal the start of the time period of the flooding of the

² James Baike, *A History of Egypt From The Earliest Times To The End Of The XVIIIth Dynasty*, Vol I, Books For Libraries Press, New York: 1929.

³ Clifford Anderson, *The Fertile Crescent: Travels in the Footsteps of Ancient Science*, Sylvester Press, Fort Lauderdale, 1968, 306.

Nile.⁴ In early Egyptian astronomical records, the star is named “Sopdet,” and is one of the earliest stars mentioned.⁵ Our common name for this star is Sirius, and not only was it the brightest object in their sky; it is actually the brightest star visible from Earth excluding the sun.⁶

The Egyptians, who were keen observers of their surroundings, observed cycles of nature. These cycles included everything from the motions of stars to the flooding of the Nile and the motions of the Sun and the Moon. From these observations the Egyptians developed a philosophy about the world that contained cyclic static ideas of order and control. This later personified itself as a god named Ma’at, which also was a concentration of that philosophy. Ma’at symbolized order and balance, peaceful inhabitation and the natural law of order. Is it safe to reason then that the Egyptians inhabited a relatively prosperous region of the Fertile Crescent, and it is because of this special dispensation that they developed such a philosophy about the natural world.

While observing the stars, the Egyptians noticed a special set of stars that did not disappear under the horizon during their paths of motion. These stars, for which we now call “circumpolar”, were proclaimed to be special gods in the sky. Apart from the regular gods represented by stars, these were called the “Imperishable Ones”, and brought a sense of physical evidence to the notions of afterlife and immortality that the Egyptians believed in. For the other stars, especially ones like “Sopdet”, their motions under the

⁴ J.B. Holberg; M.A. Barstow, et al. 1998 "Sirius B: A New, More Accurate View". *The Astrophysical Journal* 497, 1998, 935–942.

⁵ Fred Wendorf, Romuald Schild, *Holocene Settlement of the Egyptian Sahara: Volume 1, The Archaeology of Nabta Plain*,. Springer. 2001, 500.

⁶ Sirius, in reality, is 25 times brighter than our sun. The Egyptians, of course, would not have known about its absolute magnitude, only observing the apparent magnitude as it appeared to the naked eye.

horizon and return from the other side were explained also by religious concepts. Sopdet was believed to be the goddess Isis, wife of Osiris, who, at night, would travel below the horizon into the underworld and help resurrect Osiris in accordance with Egyptian mythology.⁷

The massive pyramids the Egyptians built also paid tribute to the Egyptians reverence for the sky and patterns the stars made. The Great Pyramids of Giza were constructed to align with the stars that circle Polaris; the base of the Pyramid forms a track for which the northern stars circle the heavenly poles.⁸ The Egyptians engineered a replication of the paths of the celestial bodies they thought were gods to perhaps facilitate the entrance of dead pharaohs to the afterlife. Supporting this idea are the numerous shafts discovered which also align with skyward objects. Several ideas about the shafts and vents developed over time. One idea held that the Pharaoh's spirit would leave the body and ascend to the celestial afterlife much like a rocket would be oriented on a track, thereby pointed towards the stars and finally joining the other gods and past pharaohs.

Sun worship was also prevalent in all ancient societies. The idea of the sun in Egyptian culture was dynamic and alive; conceptions changed many times throughout Egyptian history due to political and economic forces. Movements and motions of the sun signified the seasons and growing and cultivation periods. As the sun makes its journey across the earth's sky, several points of equal time are apparent, called equinoxes. The shortest period of sunlight in the sky in the northern hemisphere is called the winter solstice; the longest is the summer solstice. All ancient cultures considered these to be the

⁷ Holberg, Barstow, et al.

⁸ John Eddy, *Astronomy of The Ancients*, Ed. Kenneth Brecher, Michael Fiertag The MIT Press, Cambridge, 1979, 2.

harbingers of the seasons and signifiers of times to plant and harvest. An appreciation of the sun and its motions developed in the hunter-gatherer societies existed, but the importance of measuring its motions were much more consequential in the agricultural societies that inhabited the Fertile Crescent and other areas of agricultural dependence.

For the Egyptians, worship of the physical sun disk was an important facet of religious life.⁹ It was believed that the sun god Ra physically moved our home star across the sky in a boat, working against opposing gods who tried to oppose him. In other cases he was also characterized as a beetle that pressed against the sun, pushing it from one end of the horizon to the other. Changing cults also facilitated the changing interpretations of how the Egyptians viewed the sky. The sun god Ra was combined with Amun, a creator deity in his own right, and conceived as a new deity in its own right.¹⁰ This new deity was called Amun-Ra, and as his cult rose, he challenged all other deities in the Egyptian's minds for power. A hymn written to Amun-Ra both supported the physical and spiritual views of him:

"When thou crossest the sky, all faces behold thee, but when thou departest, thou are hidden from their faces.. When thou settest in the western mountain, then they sleep in the manner of death..The fashioner of that which the soil produces,...a mother of profit to gods and men; a patient craftsmen, greatly wearying himself as their maker..valiant herdsman, driving his cattle, their refuge and the making of their living..The sole Lord, who reaches the end of the lands every day, as one

⁹ Marshall Clagett, *Ancient Egyptian Science*, American Philosophical Society, Philadelphia, 1989. 266.

¹⁰Vincent Tobin, *The Essential Guide to Egyptian Mythology*, Ed. Donald B. Redford, Berkley Books, 2003. 20.

who sees them that tread there on..Every land chatters at his rising every day, in order to praise him.”¹¹

The Hymn plays on both the physical motions of our sun, and the notions of what they spiritually meant for the newly conceived deity and the Egyptian people.

Amun-Ra was also challenged by another concept of what the sun was and its implication on Egyptian society. When the pharaoh Akhenaton achieved power in the Eighteenth dynasty, our home star and its previous interpretation under Amun-Ra changed again. Akhenaton instituted a belief in the physical sun disk as a god by its own right.¹² The astronomy of these ancient peoples was utilized to perform a political movement away from Amun to the sun disk, now named Aten. Amun’s name was rubbed off of public places, his cult followers stripped of their powers, and the companion god Ra was merged with Aten. Now, in every picture or glyph produced, the fingers of the sun disk were shown to reach down to Akhenaton, his wife Nefertiti, and their daughters, “touching” them with power and approval. When the actual disk of the sun was being worshipped, its radiating warming effect was only considered one specific aspect of the power of Aten.

Roughly the same size in the sky due to its close proximity to the Earth, the moon is often seen in ancient religions as a sister of the sun or an opposing force. In ancient Egypt, the moon was recognized as having a similar function to the sun, being its substitute in the night sky. To the Egyptians the moon was personified as the god Iah, an older god whose popularity declined early. The god Khonsu then became the god of the moon bearing a moon disk upon his crown and, along with Thoth, was a god marked as

¹¹ John A. Wilson, *The Burden of Egypt*, University of Chicago Press, 1951, 211.

¹² Clagett, 267.

one who kept the passage of time. Because of this, the Egyptians developed a calendar and month system, which corresponded to the passing of time with respect to lunar motion. Khonsu was seen as a god who was a protector and healer of Horus, and therefore a god who could heal and protect the Pharaohs from evil spirits.¹³ An interesting aspect of the moon played into how the Egyptians viewed it. As the moon cycles the Earth, it is shown to move in phases, thus appearing to “renewing itself.”¹⁴ The cycles of the moon play exactly into the Egyptian obsession with cycles of death and rebirth, reinforcing their outlook on the natural world. Since the moon could renew itself, Khonsu was also called “Khonsu the Child.”¹⁵

Easily visible and equally, if not more, as magnificent as the Sun and Moon was the disk of the Milky Way Galaxy visible from the Earth. For the ancient Egyptians, the Milky Way was another celestial manifestation of a phenomenon on Earth; the disk was a heavenly river, a spiritual Nile. As the Nile River gave life and rebirth to the Egyptian area, the Celestial Nile gave rebirth to the Pharaohs and sustained the afterlife. This also reinforced other beliefs, such as Amun-Ra rowing the sun boat across the horizon, Isis traveling into the underworld to resurrect Osiris, and the Pyramids being the launching point for Pharaohs to begin their track for journey into the afterlife. As important as the actual Nile was for them, the heavenly Nile served as an important idea in theology and religious practice restricted to the afterlife. As one served to maintain balance in the world below, the other served to maintain balance in the heavenly realm above. It is

¹³ Redford 20.

¹⁴S. Quirke, A. J. Spencer, *The British Museum Book of Ancient Egypt*, London, The British Museum Press, 1992.

¹⁵ Redford 20.

interesting to note however that Egyptian Astronomy is characterized in our modern view as “never rising above the level of crude observations to develop into a science.”¹⁶

III. Ancient Mayan Observations and Concepts

Another ancient society placed just as much, if not more, importance on cosmic cycles and recorded the motions of heavenly bodies.¹⁷ The ancient Maya Society is well known for its obsession and precision with recording astronomical events and calendar making.¹⁸ The ancient Maya, through what must have been long examination and dedication to sky watching, deduced the cycle of the sun relative to our view from the Earth and were extremely interested in when the sun was directly positioned overhead. As with the Egyptians, the Mayan civilization was interested in astronomical movements for practical everyday purposes.

In some ways similar to Greek and Mesopotamian societies, the Maya were a conglomeration of many independent city-states ruled by kings that existed in Central America. The Maya shared a relatively prosperous standard of life compared to other ancient societies. Much like the Egyptians, they were allowed to focus on the cycles they viewed in life rather than the constant contemplation of food, shelter, and well-being. Much of the strife between them was an artificial creation. The large fauna and wealth of natural resources allowed them to thrive in their location. Because of this, they were able

¹⁶D. R. Dicks, *Early Greek Astronomy To Aristotle*, Cornell Univ. Press, Ithaca 1970, 28.

¹⁷E. C. Krupp, *Archaeoastronomy And The Roots of Science, AAAS Selected Symposium*, Westview Press, Boulder, 1984. 211.

¹⁸Mayan Origins: Predating and Reassessing *Science News* , Vol. 109, No. 17 (Apr. 24, 1976), p. 261

to construct the only complete written language in the pre-Columbian era, and they were able to deduce much of astronomical movements and mathematics. They “were highly devoted to astronomy and were highly developed in that line.”¹⁹ The separation of the Atlantic Ocean did little to deter the tradition of reverence for the skies by early ancestors, or as historian J. E. S. Thompson wrote: “ I see no evidence that Maya success in astronomy and calendrics owe anything ... except for a basic stratum, one may suppose, by hunter-gatherers crossing from... the Bering Strait from 10,000 B.C. onward.”²⁰

Many similarities of cosmology exist between the Egyptians and the Maya. Both societies envisioned three layers of the universe: a heaven, our world, and an underworld. This could be understood in the fact that ancient societies viewed the heavens, the skies, the ground they lived on, and finally they reasoned that an equivalent of the heavens must exist either below them as an underworld, or a removed spirit world with bridges to our reality. The Maya also worshipped the sun as a god, Venus as the most important astronomical object, and they employed a various number of explanations and religious justifications for what they viewed in the skies. They, like the Egyptians, placed what religious and societal institutions they held onto the heavens.

The Maya shared many other similarities with the Egyptians. Their social structure was set up similarly; a supreme leader at the top surrounded by public officials and religious scribes staggered down to the local level, and at the bottom were common

¹⁹Luis Rosado Vega, Sr. Mayan History Revised by Mexican Archaeologist *The Science News-Letter*, Vol. 24, No. 656 (Nov. 4, 1933), pp. 300-301

²⁰J. E. S. Thompson , Maya Astronomy *Philosophical Transactions of the Royal Society of London. Series A, Mathematical and Physical Sciences* , Vol. 276, No. 1257, The Place of Astronomy in the Ancient World (May 2, 1974), pp. 83-98

laborers and farmers. The sacred king, who represented the whole of priesthood and head of state, absorbs all of their religious direction. The scribes and priests primary function were writing and reading.²¹ Their beliefs in their gods were fluid and non-corporeal too, as historian H. Bonnet wrote of the merger of Ra and Amun in Egyptians theology:

The formula Amon-Re does not signify that Amun is subsumed in Re or Re in Amun. Nor does it establish that they are identical; Amun does not equal Re. It observes that Re is in Amun in such a way that he is not lost in Amun, but remains himself just as much as Amun does, so that both gods can again be manifest separately or in other combinations.²²

The Maya held similar beliefs about their deities too, and often attributed several different facets of the natural world to different deities at the same time. They also placed a heavy importance on the sun and its function as the life giver of the Earth and recorded its motion across the sky.

For the Maya, the most important astronomical object is Venus. With brightness greater than that of all of the terrestrial planets, Venus owes it high albedo due to a runaway green house effect in the atmosphere. The layer of thick clouds that cover the planet reflects seventy percent of the sunlight that strikes it. Modern Astronomers cannot peer onto Venus' surface with our equipment in the optical band our eyes see, rather, we have to use equipment that can "see" in other frequencies, such as radio. To our ancient brethren, Venus, as it is the brightest object that could appear in the sky, (other than supernova explosions or perhaps comets) could only be thought by ancient societies as

²¹ S. Houston and T. Inomata, *The Classic Maya*, Cambridge University Press, 2009, 61.

²² H. Bonnet, *Reallexikon der ägyptischen Religionsgeschichte*, Berlin, 1952. 239. Clagett, 268.

having a great importance. For them, Venus with all of its brightness, must have been a companion to the bright sun due to its positioning always in the sun's proximity, and thereby in its own right a god. They called this specific deity Chak Ek', but not only did they worship the god of Venus, they hailed it as even more important than the sun itself.²³

That is not to proclaim that the sun did not have its own honor and place in Maya thoughts about the cosmos. The Maya mapped out and understood the sun's motion at both equinoxes and solstices. At the archeological location named "Group E", an architectural marvel of Mayan dedication to the sun, the commitment is clear.²⁴ At this location in the area of Uaxactun, several buildings serve as possible ancient observatories.²⁵ One building serves as a base attachment, with three buildings spread out before them. The north structure lines up with the sun during the sunrise of the summer solstice, the south structure with the winter solstice, and the central structure lines with the equinoxes. The Pyramid named E-VII is the base observation structure. To construct such a precise and elegant structure pertaining to the rising of the sun signifying seasons entertains both ideas about the practical, and not to be forgotten, supernatural connections they held with our home star.

Religiously, like most other ancient cultures, the Maya held the sun as a god and its name was K'inich. The Maya kept very detailed solar calendars and records of the sun's movements for various religious, social, and agricultural reasons.²⁶ Unlike the Egyptians, who only needed to know when Sirius rose and set with the sun to know of the

²³ Dresden Codex.

²⁴ Hunter, C. Bruce. *A Guide to Ancient Maya Ruins*, University of Oklahoma Press, 1974, New York. 16.

²⁵ Modern day location of Petén, Guatemala.

²⁶ Gregory Severin, *The Paris Codex: Decoding an Astronomical Ephemeris*, American Philosophical Society, Vol. 71 Part 5: 1981, 38.

flooding of the Nile, the Maya decided to keep more detailed records of all of the astronomical objects viewable from earth.²⁷ They kept records in detail of Mars, Venus, the Sun, and the Moon.²⁸ They also took notice of the disk of the Milky Way Galaxy viewable to us as a band of light. Like the Egyptians, they associated this humbling sight in the night sky with something familiar to them. The Milky Way was thought of as a giant tree, fully realizing its growing potential only when the constellation Sagittarius passed through it, thus making it erect and fully-grown. The Maya were also adept enough to understand seasonal changes to the constellations, and named the Milky Way that appeared in the winter skies the “White Boned Serpent”.²⁹

The most prominent characteristic, however, that the Maya were known for was not their observation or beliefs about astronomy, which is stupendous in its own account, but rather, their intense and detailed calendar making. Their meticulous notation of movements and paths of celestial objects lead to exquisite calendars, some of which extend out to both when they considered creation had occurred and included cycles for which they thought cosmic events would occur. The Dresden Codex, a table of movements, positions, and orbits of Venus and eclipses of the Sun, was used to determine favorable events and instructions. These were believed to be performed by religious priests, but soon became clear that the function of the tablet was record keeping and to serve as a compass to find locations of the gods.^{30 31} The scribes and priests were reduced

²⁷ Anthony Aveni, *Skywatcher of Ancient Mexico*, University of Texas Press, Austin, 1980, 169.

²⁸ T. Patrick Culbert, Patrick, *The Lost Civilization: The Story Of The Classic Maya*. Harper and Row, New York, 1974, 76.

²⁹ David Freidel, Linda Schele, Joy Parker, *Maya Cosmos*, Willaim Morrow New York, 1993. 78.

³⁰ Ibid 44.

in thinking to a sort of magnified record keeper and not supreme leaders. They also had their own gods and worshipped a monkey or monkey-man hybrid god that has many similarities to the god Thoth from Egyptian theology. Both were scribe gods who set out the natural order and invented writing.³²

Some of the calendars run these cycles backwards to a determined date representing creation. To the Maya, "Creation was at the heart of everything they represented in their art and their architecture."³³ They also considered the day of creation incredibly important in their consideration of cycles. The Maya, in their precise observations, determined the length of the year to within two hundredth of a percent of accuracy, saying that length of a year was 365 days. The actual cycle of creation was much larger, a number consisting of years to the power of twenty. This large number of years determined how time moved in the minds of the Maya. For them, "time only appears to move in a straight line. The creation date is a point on ever larger circles within circles within circles of time."³⁴ This obsession with time is "unparalleled in history."³⁵ Their cycle has caused a pseudo-scientific scare within our own modern time frame, as one of their cycles ends during December of the year 2012. The effects expand have been widely discussed among conspiracy theory enthusiasts and the like.

What would cause the ancient Maya and the Egyptians to both consider the world to be so cyclic and static? Firstly, for these ancient societies to consider these important issues, they must have the physical time and mental well being to do so. All ancient

³¹ Dick Teresi, *Lost Discoveries: The Ancient Roots of Modern Science—from the Babylonians to the Maya*, Simon and Schuster, 2002, 96.

³² Michael D. Coe, *Breaking The Maya Code*, Thames and Hudson, 1992, 226.

³³ Ibid 60.

³⁴ Ibid, 63.

³⁵ Krupp, 212.

societies tried to understand the skies to do both practical and spiritual processes, such as astrology.³⁶ The special dispensation of these two societies can be attributed to the environmental, physical, and geographical location on the Earth. Egypt was equipped with the life giving and sustaining Nile, which separated them from the harsher climates and agricultural hardships faced by many of their neighbors in the Fertile Crescent. They had the time to ponder such mysterious and the disposition to interpret the world in benevolent terms. The Maya had a similar outlook and the prosperous life they experienced was comparable in terms to the Egyptians. The large amounts of fauna and abundance of natural resources kept them in comfortable spirits; much of the strife and bloodshed was artificially caused between them. They entertained such great cycles and comparably advanced ideas about the cosmos due to the position they held in it.

IV. Ancient Mesopotamian Astronomy

Not all ancient societies considered the world so regular. The ancient Mesopotamians, who lived near the Tigris and Euphrates rivers, lived in a very different world than the Egyptians or the Maya. The Mesopotamians lived in a world full of strife.³⁷ Life or death at times was daily battle. They encountered more natural disasters, drought and famine, war and pestilence, and everyday struggle than the Ancient Egyptians or Maya, who were comparably isolated from such things by their geographical location and environmental luck. In light of such difficulties, it is reasonable

³⁶ Ibid.

³⁷ Noah Edward Fehl., *Science And Culture*. Chung Chi Publications, Hong Kong, 1965. 7.

to predict the Mesopotamians would construct a very different cosmos for themselves; a cosmos that reflected their position in the world, and their hardships endured in it.

The principal difference between the Egyptians and Mesopotamians was the nature of the rivers both societies were built near. Whereas the Nile flooded peacefully and provided life for the Egyptians who lived near it, the Tigris and Euphrates were able to flood violently in such ways as to destroy the lives of the people in the vicinity.³⁸ Many historians believe that the ancient flood stories found in many of the religions of the ancient world descended from a flood that occurred due to melting of ice in the most recent ice age. If such an event occurred, it undoubtedly would have destroyed anything in the way of its flood path. The Mesopotamians also did not enjoy the abundance of fauna and natural resources that the Maya did, and sometimes faced food shortages that braced their populations.

The Mesopotamians lived in a social system that became city based over time. Gods, temples, priests, and whole administrations belonged to separate city-states among the area. These factions would war with one another, changing the *zeitgeist* of the cities in relation to who the victors were. As these battles happened, beliefs and understandings of the universe changed with conflict to conflict.³⁹ One major shift happened when the city of Babylon ascended to supreme control of the area, and instituted its supreme deity, Marduk, and its religious and cultural ideas about the natural and supernatural worlds. Most importantly, to the field of astronomy, was the discovery of Babylonian astronomy by the Greeks who integrated some parts of it into their efforts. Our modern astrology is

³⁸ Anderson, 25.

³⁹ Fehl, 7.

also derived from the Babylonians beliefs about the connection between astronomical patterns and events on Earth.

Ancient Mesopotamian cosmologies and creations myths reflect this disconnect between Egyptian beliefs and their own. Perhaps the only constant is the conception of ancient primordial waters, from which the world is brought forth.⁴⁰ Almost all of the ancient cultures of the Fertile Crescent feature this type of creation story, insomuch that “the cult was not evolved later as a result of civilization. It was rather a precondition of civilization.”⁴¹ Several versions of the creation story exist, due to the nature of competition between the cities that formed them. One story has the existence of the water called Nammu, and all creation bursting forth from her. The sky was then born and called *an* and the Earth was called *ki*. Where the two met created another deity called Enlil, who lifts the space in between the two realms. A dissimilar story held that Tiamat and Abzu were created from the ancient water. Tiamat was an ancient sea goddess of evil, and Abzu was called the father of all gods. All of these gods acted in congress together, with an additional concierge called the Annunaki, which were an additional fifty or more gods.

Unlike the Egyptians, who viewed their gods as shepherds and caregivers, the Mesopotamians viewed themselves as the property of the God who ruled their city. This was in stark contrast to the beliefs of the Egyptians. The gods were perceived to have characteristics like the humans who worshipped them: jealous, petty, a strong inclination for alcohol and festivals, and having a vengeful wrath at times.⁴² The people perceived them to be in the need of sustenance and worship, and to satisfy this end, a new priestly

⁴⁰ Ibid, 9.

⁴¹ Ibid.

⁴² Ibid, 15.

class was formed and temples brought into existence to serve these functions.⁴³ These beliefs contracted the populace into a Master-Slave relationship with the gods, only to be expected of peoples who could face their demise on a whim of circumstance.

Cosmologies between city-states changed due to ebb and flow of political power. The Babylonians chief deity was known as Marduk, and he takes a central role in their cosmology, fighting the evil sea goddess Tiamat.⁴⁴ The Enuma Elish enlightened some of the inner workings of the theology:

When the sky above was not named, And the earth beneath did not yet bear a name, And the primeval Apsu, who begat them, And chaos, Tiamat, the mother of them both, Their waters were mingled together, And no field was formed, no marsh was to be seen; When of the gods none had been called into being... In Apsû was Marduk born, In pure Apsû was Marduk born, Ea his father begat him, Damkina his mother bore him... Had fulfilled the desire of Nudimmud, He strengthened his hold [on the Bound Gods], And returned to Tia-mat, whom he had bound. Be-l placed his feet on the lower parts of Tia-mat, And with his merciless club smashed her skull.⁴⁵

Marduk then took the remains of Tiamat and constructed most of the known world, making humans from the remains of Tiamat's inner parts and waste. This idea reinforced their own standing before the gods; they were waste of the gods created to be the servants and slaves of their lords and masters, a stunning rendition of the master-slave premise applied to natural-supernatural relations.

⁴³ Ibid, 13.

⁴⁴ Thorkild Jacobsen *The Battle between Marduk and Tiamat* Journal of the American Oriental Society, Vol. 88, No. 1 Jan. - Mar., 1968, 104-108.

⁴⁵ Enuma Elish.

When Marduk was victorious over Tiamat, he then gave natural order to the universe, fixated the calendars and aligned the stars in the sky. To the Babylonians, Marduk is the father of astronomy and astrology and the master of the phenomenon they saw. The Mesopotamians had long before established what they held in beliefs in respect to the sky, Marduk was just another name applied to a generic theology.

Jupiter in numerous ancient cultures almost always represents alpha gods. More than any of these ancient cultures could have imagined, Jupiter may be the key to the propagation and sustentation of life on the Earth. Jupiter is a massive gas giant planet made primarily of hydrogen and helium and it is so large that if it were thirteen times more massive it could be classified as a brown dwarf star. The huge gravitational effect it has on objects near it in the solar system may keep asteroids and other debris from colliding into the Earth. Although not the brightest object, Jupiter is visible for most of the night, only outshone by Venus who only appears at early evening or in the morning, as it streams its way across the sky. It is most likely for this reason that most societies attribute their chief deity to the planet. Consequently, the Babylonians did notice the brightness of Venus in relation to Jupiter, naming the planet “bright queen of the sky,” attributing it to Ishtar.⁴⁶

Babylon found itself with quite sophisticated equipment and technology compared to the rest of the ancient world. They had “three instruments, which seemed to be of their own invention, the sun dial, the clepsydra or water clock, and the polos.”⁴⁷ With these tools they investigated the skies above them and found cycles to what they

⁴⁶ Venus tablet of Ammisaduqa.

⁴⁷ Benjamin Farrington, *Science in Antiquity*. Oxford University Press, New York, 1969. 11.

saw. Their reasoning behind such was that by plotting out the motion of the Sun and what arrangement of stars it would rise in, combines with motions of the moons and planets, one could successfully predict how the gods were to act.⁴⁸ In their age of chaos and uncertainty of health and safety, this foreknowledge was as precious as gold. They could also use this to their political advantage to maintain control of the populous.⁴⁹ Even though their motivations for observing the heavens were misguided, “their observations, extending over hundreds, even thousands of years, were recorded with accuracy and became the material of true science.”⁵⁰

With these tools they constructed their Zodiac, “houses” of certain figures or deities. They were called thus by the Greeks, where “zodion” means small animal. Like many other cultures, the Mesopotamians saw figures from their own mythologies and folklore, and transfixed them onto the night sky. In this method of mapping the sky and making observations as to how the stars moved, the prototype of modern astronomy was born. In light of this, historian Leonard W. Clarke stated: “Recent studies of Babylonian sources have shown that we must revise former estimates of the extent to which the Greeks were indebted for the details of their astronomy to the Babylonians; the debt proves to be much greater than had been imagined, and further research may prove it to have been greater still.”⁵¹ The Babylonians apparently took such great precision in their record keeping that their records today can be used to “estimate the (de)accelerations...of

⁴⁸ A. Sachs *Babylonian Observational Astronomy* Philosophical Transactions of the Royal Society of London. Series A, Mathematical and Physical Sciences, Vol. 276, No. 1257, The Place of Astronomy in the Ancient World, May 2, 1974, 43-50.

⁴⁹ Benjamin Farrington, *Science and Politics in the Ancient World*, Barnes and Noble Inc., New York, 1939, 70.

⁵⁰ Farrington, 11.

⁵¹ Leonard W. Clarke, *Greek Astronomy and Its Debt to the Babylonians*. The British Journal for the History of Science, Vol. 1, No. 1 Jun., 1962, 65-77.

the Earth's rotation and the orbital velocity of the moon."⁵² It is from these well kept records that we have adopted the practice of divination by horoscopes, with models based almost exactly on what the Babylonians scripted in their time. Their belief that the constellation that the sun appears in on your month of birth can influence your mood, personality, traits, hobbies, and relationships was transcribed into our society, but not only that, the actual belief that future occurrences can be predicted was preserved as well. This, for these peoples who lived on the knives' edge of life and death, greatly yearned to have any advantage whatsoever.

These practices not only had influence on other cultures, but also came to influence greatly the future of the Mesopotamian area. When the Neo-Babylonian Empire was founded, the earlier astronomy and astrology was taken to be second nature to the population and was a part of ancient tradition that was to be upheld. The Chaldeans increased the accuracy and frequency of observations with better tools and more understanding. After this, they developed an eighteen-year lunar cycle that was based on lunar eclipses.⁵³ Ptolemy found these useful in his derivation of the start of the Chaldean era of Neo-Babylonia, successfully gaining important dates on the past such as the fall of Jerusalem to the Babylonians and the length of the reigns of the other kings. Some other parts of Chaldean astronomy proved to be quite astute. They, for example, in their observation of the sun, determined that its ecliptic movement was not uniform, and while

⁵² R. R. Newton *Two Uses of Ancient Astronomy* Philosophical Transactions of the Royal Society of London. Series A, Mathematical and Physical Sciences, Vol. 276, No. 1257, The Place of Astronomy in the Ancient World May 2, 1974, 99-116.

⁵³ A. Aaboe, J. P. Britton, J. A. Henderson, Otto Neugebauer, A. J. Sachs (1991). "Saros Cycle Dates and Related Babylonian Astronomical Texts". Transactions of the American Philosophical Society (American Philosophical Society) 81 (6) "One comprises what we have called "Saros Cycle Texts," which give the months of eclipse possibilities arranged in consistent cycles of 223 months (or 18 years)."

not having a physical explanation for the phenomenon, made it known.⁵⁴ It is clear, however, that the Chaldeans were not interested in theories of astrophysics, but only their relative positions to each other to determine what future events held.

Political powers not only changed in the region of Babylon, but religious homogeneity changed too. When the prophet Zoroaster claimed to have a vision from the one true god, Ahura Mazda, he spread his teachings of monotheism to the surrounding area. Zoroastrianism, as it spread in the Middle East, held much of the same conditions of Mesopotamian theology. There were many gods, some in the underworld and some above the Earth, but in this theology they were at war with each other. The court of Annunaki had been split up and turned on itself. Above the world in his celestial throne, Ahura Mazda, the creator of all things good, waged war with the being that was responsible for all evils, Angra Mainyu. Each had a number of angels and demons aligned with them, and it was said that we humans were in the focal point of the battle, and our souls were susceptible for either side to take.⁵⁵

Even in the new theology, however, astronomy and astrology were deep rooted. Seven layers of heaven and the underworld were constructed with spheres of stars and angels who inhabited each level and demons and creatures below. In the final judgment, the heavens will be lowered to the moon and the earth raised to their level.⁵⁶ A form of Zoroastrian monk called *magi* was a person who was deeply knowledgeable about the positions of the stars. It is this type of individual that makes it into the nativity myths

⁵⁴ David Leverington *Babylon to Voyager and beyond: a history of planetary astronomy*. Cambridge University Press. 2003, 6–7.

⁵⁵ Mary Boyce, *Zoroastrians: Their Religious Beliefs and Practices*, London: Routledge. 1979.

⁵⁶ *Ibid.*

about the head deity of another religion, what would become Christianity. It was three astrologers that visited Jesus' birth, although they were later called wise men.⁵⁷

Zoroastrian astrology must have also proved to be popular with many other Jewish individuals, many synagogues have been found with zodiac art and symbols in them.

V. *Astronomy and Astrology in the Hellenistic World*

The Greeks occupied a world that both held natural disasters and was rife with political confrontations. In light of this, the Greek world constructed a cosmology that was also much like the Mesopotamian: war-like, based on the personal struggle between the gods of Olympia and the titans who held power, and also the struggle between Zeus and his father, Cronus. This is similar to the battle between Marduk and Tiamat and filtered through the Hurrian/Hittite myth of Kumarbi.⁵⁸ The natural disasters that may have been possibly experienced by the Minoans and the tsunami caused by the collapse of a volcano at Thera pushed the Greeks to understand and construct a cosmos of strife and violence by the gods, much like the Mesopotamians.

Greek mythology is predicated upon Chaos, which existed and then brought forth the gods Gaea, Eros, Tartarus the underworld, and Erebus the darkness. Gaea then gave birth to Uranus to whom she then bore the rest of the Titans. Gaea convinced Cronus her son to castrate Uranus and become ruler of the Titans with his wife Rhea. Cronus and

⁵⁷ W. Drum, "Magi", The Catholic Encyclopedia, New York: Robert Appleton Company. 1910.

⁵⁸ H. G. Güterbock, *The Hittite Version of the Hurrian Kumarbi Myth: Oriental Forerunners of Hesiod*, American Journal of Archaeology, Vol. 52, No. 1, 1954, 123-34.

Rhea then gave birth to the twelve Olympians, thereafter Zeus committed the same patricide that Cronus had committed, through a series of godly tricks and war between the Olympians and Titans. This proto-world of war and struggle between the gods was conceived in the same way of the Mesopotamians; the natural world was tough, full of danger and catastrophe and unexplained calamity that hide behind every corner. If we humans, they may have thought, lived in a world of such chaos, then surely the gods must have lived in one too, although they wielded much more power over circumstance in theirs.

These gods, like all the others, were also envisioned in the skies. Zeus was the ever-bright figure in the night sky, for which we now call Jupiter for the Roman version of himself. Apollo (sometimes syncretized with Helios) carried the sun around in his chariot much like Amun-Ra. Aphrodite, the god of love and erotica, was the beautiful star that sat and rose with the sun. The Greeks knew these objects held different orbits in relation to the stars behind them, so they called them *the wanderers* and made them the gods of their mythologies. Even the magnificent Milky Way Galaxy viewable to them was a squirt of milk from the breast of Zeus' wife Hera; galaxy is a word derived from the Greek word for milk. It was also called the road to Olympia or the ruin of Apollo's chariot, much akin to Egyptian beliefs about a Celestial Nile.

Beyond the first construction of the pantheon of the Greek gods, the Hellenistic world shares some other similarities and differences with the Mesopotamian social and state blueprint.⁵⁹ Ionia became a melting pot of various ideas from cultures that surrounded them; Mesopotamia, Egypt, and other Middle Eastern ideas siphoned into the

⁵⁹ Ian Morris and Barry B. Powell, *The Greeks: History, Culture, and Society*, Upper Saddle River, New Jersey: Pearson Education, Inc., 2006, 172.

area.⁶⁰ Whereas both areas were constructed of warring city-states that rose up against each other for power at times, the Greek cities sometimes adopted peaceful federations of those city-states who coexisted peacefully. Such a system allowed very diverse views of the universe to grow and be adopted by different thinkers in different areas at different times. For this reason, approaching Hellenistic astronomy can be a complicated matter. One of these thinkers was Democritus, who posited that the world could be interpreted by experimentation and observation alone, and that the ideas of gods and overarching deities who directly caused the functions of the physical world was false.⁶¹

Democritus is counted among the Ionian scientific thinkers. This included philosophers like Aristarchus, who proclaimed that the Earth revolved around the sun, and Thales, who suggested that earthquakes were not the power of Poseidon exerted on the earth, but rather the effect of the land floating on a bed of water.⁶² All of the Ionian thinkers strived to understand the physical world by the physical world itself.⁶³ These ideas were not held without contempt however, as many more philosophers constructed views that did facilitate physical events moved by the hands of the gods. These views were destined to come in conflict with one another.

On the opposite end of the spectrum were thinkers like Pythagoras, the Pythagoreans, and Plato. Little is known about the actual man Pythagoras, or his contributions to ancient science due to a cloud of mysticism that surrounds him. This is

⁶⁰ Roger Penrose and Erwin Schrödinger, *Ionian Enlightenment, in 'Nature and the Greeks' and 'Science and Humanism'* Cambridge University Press, Cambridge, 1996, 55.

⁶¹ Bertrand Russell, *A History of Western Philosophy*, Simon and Schuster 1972, 64-65.

⁶² Heath, Sir Thomas, *Aristarchus of Samos, the ancient Copernicus ; a history of Greek astronomy to Aristarchus, together with Aristarchus's Treatise on the sizes and distances of the sun and moon : a new Greek text with translation and notes*. London, Oxford University Press. 1913.

⁶³ Morris, Powell, 172.

fitting however, due to the mindset of the quasi-religious sect founded around him. The Pythagoreans were a cult of a mystic nature who focused more on philosophy and thought experiments, rather than actual physical methods championed by Democritus and others.⁶⁴ The Pythagoreans held that nature held a perfection of both mathematical and geometric conditions. To them, the Earth was a place of great importance, and they could not conceive a universe that did not include the Earth at its complete and utter center built and constructed with what they perceived as five perfect regular solids. They also believed in the secreting away of knowledge contrary to their beliefs. When they discovered that the square root of the number two was an irrational number, they decided that the knowledge was too controversial for the general public, and hid it away from them. These views went at the very essence of what the other Ionian thinkers and Democritus had proposed, and they succeeded in concealing both the method championed by the Ionians, and the knowledge that disagreed with fundamental tenants they embraced.

Plato was inspired by these views and aligned himself with Pythagorean thought. To him, understanding the physical world meant a greater emphasis on thought processes and consideration of mathematics, rather than full on embracement of observation. Plato expresses this fully when in *Epinomis* he says:

The true astronomer must be the wisest of men, understanding by the term, not the man who cultivates astronomy in the manner of Hesiod and all others of that type, concerning himself only with such things as risings and settings, but the man who investigates the seven revolutions included in the eight revolutions, each of the

⁶⁴ Russell.

seven describing its own circle in a manner such as would never be easily comprehended by an one unless he posses extraordinary powers.⁶⁵

Plato also espoused a harsh view of the Ionians, once writing that he wished to “burn all the writings of Democritus that he could collect.”⁶⁶ The rivalry of philosophers in ancient Greece is not uncommon, however; Xenophon and Plato were also at odds with one another.⁶⁷ Plato, in his writings, also aligns the Pythagorean method of thought problems along with knowledge and astronomy, writing that we should study “astronomy, as we do geometry, by means of problems, and we shall dispense with the starry heavens, if we propose to obtain a real knowledge of astronomy, and by that means to convert the natural intelligence of the soul from a useless to a useful possession.”⁶⁸

Plato in a number of his writings mentions the existence of Zeus or another prime deity who causes not only the formation of the cosmos, but the propagation of its mechanics.⁶⁹ The Pythagoreans with their mystical thought buried the Ionians and discredited their methods and bonded thoughts about the physical world with metaphysics. This mindset, which would be stifling to the methodology of modern science, did not completely stop other individuals with great presence of mind from making inquiries into the nature of the world and discovering great things from them. These range from the deducing the shape of the Earth as spherical and its circumference by Eratosthenes, to Hipparchus determining how to predict the behaviors of the planets

⁶⁵ Plato, *Epinomis*, 990 A, B. However see the controversy surrounding the authenticity of this document.

⁶⁶ R. Ferwerda, *Democritus and Plato*, Mnemosyne, Fourth Series, Vol. 25, Fasc. 4 (1972), pp. 337-378.

⁶⁷ Ibid.

⁶⁸ Plato, *Republic*, VII, 529 A-530 B.

⁶⁹ Plato, *Paedo*, 108 c-110 A. *Phaedrus*, 246 E-247 C., *Timaeus*, 33 B-34 B.

and the moon.^{70 71} The Greeks very obviously set out to understand the natural world in a much different approach than the Egyptians or Mesopotamians or Maya. However, this is not to say that the spiritual memory of using the stars to gain an advantage in fortune telling or predictions was absent from Greek society all together, the mysticism of the Pythagoreans allowed such ideas to survive and flourish. If one wanted to use Greek society as an antecedent for modern science and separation of science and spiritual belief, they would be satisfied with the former and disappointed in the latter.

The highest point in Hellenistic Astrology came when Ptolemy set out in his work *Tetrabiblos*, the fixation and rules of horoscopic predictions.⁷² Astrology was so much used in even these ancient societies that political entities began to rely on those ideas for guidance and advice. Due to the expansion of Alexander the Great into Babylon, Chaldean Astrology came into contact with Greece and Hellenistic Egypt. Astrology was then taught in Greece and culminated in two forms, one that taught the prediction of the past, present and future events lay within the motions of the planets, and one that taught that astrology was a method of communication with the divine, a channel to communicate with the gods.⁷³ Beyond the Greeks, who often used astrology along with oracles and other divine methods, the Romans quite easily adopted it into their political and cultural systems.⁷⁴ In certain cases even high rulers of the Roman Empire flirted with astrology. During Julius Caesars' death and funeral a comet was said to pass overhead for the time

⁷⁰ Otto Neugebauer, "Notes on Hipparchus". In Weinberg, Saul S. *The Aegean and the Near East: Studies Presented to Hetty Goldman*. Locust Valley, NY: J.J. Augustin. (1956).

⁷¹ Donald Engels, "The Length of Eratosthenes' Stade". *American Journal of Philology* 106 1984 (3): 298–311.

⁷² Ptolemy, *Tetrabiblos*.

⁷³ Nick Campion, *Introduction to the History of Astrology*, 1982 173-174.

⁷⁴ Campion, 1.

period, embodying his deification.⁷⁵ When Nero caught sight of a similar comet that was said to predict the fall of great leaders, he had prominent members of the state executed, although they had been found to be conspirators as well.⁷⁶ The Roman Emperor Tiberius was said to have had his entire life predicted for him and aligned himself with Tiberius Claudius Thrasyllus, an official astrologer for him.⁷⁷

How could the Romans and Greeks so brilliantly apply the rules of geometry and mathematics to the study of celestial objects and yet still use the concepts derived from the Babylonians and Egyptians? Popular science writer and astrophysicist Carl Sagan claimed that such desires were made of ancient people yearning to have a connection with the vast universe that surrounded them.⁷⁸ Perhaps such beliefs also coincide with the mysticism that the Pythagoreans and Plato argued for. Or perhaps they, like the Mesopotamians, felt the need to gain extra knowledge about future events to distance themselves from threat and danger of losing life or property.

VI. Conclusion

All ancient cultures combined what they had held in religious and cultural systems into their observations and explanations of the cosmos. Environmental factors, geographical location, and natural processes influenced the thoughts of these ancient peoples and affected every reach of how they conceived the universe around them. A peaceful, ordered, cyclic location produced a peaceful, ordered, cyclic cosmology and astronomy. Conversely, a chaotic, dynamic, acyclic world produced a very different

⁷⁵ Suetonius, *Life of the Twelve Caesars: Julius Caesar*. 88.

⁷⁶ Suetonius, *Life of the Twelve Caesars: Nero*. 36.

⁷⁷ Suetonius, *Life of the Twelve Caesars: Tiberius*, Tacitus, *Annals of Rome*.

⁷⁸ Carl Sagan, *Cosmos*, Ballantine Books, New York, 1980, 34.

worldview, one that reflected the danger and anxiety of the world they lived in. This was reflected in their astronomy and cosmology. Societies that enjoyed peaceful, resourceful existences like the Maya and Egyptians had the time and mental health to consider the natural world, and in their astronomy they constructed circles of order. Other societies that were located in areas prone to natural disasters and aggressive movements of political powers had much more dynamic and violent cosmologies, like Mesopotamia and early Greek culture. They focused much more on astrology, in many different themes, to give them an edge in a world full of fear and uncertainty. By plotting out the paths of astronomical objects, the gods were giving them an advantage to secure themselves.

In some cases the Greeks were even able to have some success in explanation of phenomena and physical laws, however, the society in full never broke the ties between natural experimentation and mystic thought. None of these ancient cultures were able to entirely disconnect their theologies from their views on the natural world. To some cultures the separation would be strange and alien to their thought processes. To others, who made some progress in explaining the natural order, the separation of the two methods of thought ebbed and flowed.

Since humanity had developed the power to observe and question what occurred above them, explanations for what they saw came forth. When the transition from nomadic culture to agricultural transpired, the importance of practical astronomy became supremely important, a matter of life and death. The merging of the two cultures produced an ancient astronomy that was both for practical uses and religious expression. Unlike our modern world, these ideas were isolated from one another. Diving deeper into these belief systems unseals how the many theologies and explanations were derived

from the environment and world these cultures inhabited. These ideas of cosmology, astronomy, and astrology are just as much a product and function of the environment and location as the actual religious beliefs themselves.

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